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INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

CHICAGO 16, ILLINOIS

GAS ABSTRACTS

OCTOBER, 1954

VOLUME 10 NUMBER 10

AFFILIATED WITH

ILLINOIS INSTITUTE OF TECHNOLOGY

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GAS ABSTRACTS is published and distributed monthly by the Institute of Gas Technology, Chicago 16, Illinois. The contents of selected papers and patents are reviewed impartially by the editorial staff and material of potential interest to the Gas Industry is presented. Subscription rates to non-members of the Institute: $18.00 per year to U.S. addresses; $22.00 foreign.—Printed in the U.S.A.

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1. GAS INDUSTRY

Canadian Gas

Hume, G. S. NATURAL GAS SUPPLIES FROM WESTERN CANADA. *Canadian Gas J.*, 47, 11-13 (1954) July.

The desirability of a 34 or 36" pipeline from Alberta to industrial Central Canada is discussed in terms of the potential industrial market, and of construction and operating costs. Also included is a discussion of gas reserves.
R. F. Bukacek

Civic Cooperation

Clark, W. W. PUBLIC WORKS MEN SOLICIT UTILITY AID IN BETTERING PUBLIC SERVICE. *Gas*, 30, 42-44 (1954) August.

Some very convincing arguments are forwarded for increased cooperation between utilities men and city officials. Examples are cited where friendly coordination of respective policies, under the auspices of the American Public Works Association, has resulted in better service to the public at less cost. Many municipalities would greatly benefit from the revamping of outdated municipal ordinances and the instigation of uniform ordinance proposals. APWA's plea for coordination and cooperation among the several organizations serving the public has already resulted in many worthwhile improvements. Publisher's Abstract

Disaster Plans

RESTORING GAS FACILITIES IN EMERGENCY. *Gas Age*, 114, 16-20, 50-52, 54 (1954) July 29.

Technical information which will assist and guide gas utility companies in incorporating a plan to minimize possible damage from enemy bombing or natural disaster is summarized by the Federal Civil Defense Administration.
S. Volchko

Gas Industry Expenditures

GAS INDUSTRY SCHEDULES FOUR-YEAR CONSTRUCTION OUTLAY OF $3.9 BILLION. *Gas*, 30, 52 (1954) August.

The AGA reports on gas industry expenditures throughout the past four years and predicts spending schedules for the next four years. The survey contrasts the $5.8 billion spent during the 1950-1953 period with the predicted expenditure of $3.9 billion for the 1954-1957 period. These figures are broken down according to such classifications as type of gas, transmission, distribution, storage, and production.
Publisher's Abstract

Gas Sales

INDUSTRIAL-COMMERCIAL FUTURE BRIGHT. *Gas Age*, 113, 28, 29, 61, 62 (1954) May 20.

A review of the 1954 Annual Sales Conference on Industrial and Commercial Gas is presented.
R. T. Ellington

Legislation

Kuykendall, J. K. FPC FREEZES SOME NATURAL GAS PRICES. *Gas Age* 114, 31,32; 84 (1954) Aug.

New regulations resulting from the Supreme Court's decision in the Phillips case are discussed by the chairman of the FPC.
R. F. Bukacek

Robinson, J. F. WHAT DO WE FACE IN WASHINGTON? *Gas Age*, 114, 21-24, 48 (1954) July 29.

A comprehensive survey of recent Acts of Congress and pending legislation which directly affect the gas industry. W. G. Bair

2. APPLIANCES

Air Conditioning

McCrory, R. J. RESEARCH TRENDS IN AIR CONDITIONING WITH GAS. Preprint, Amer. Gas Assoc. Research and Utiliz. Conf., Cleveland (1954) June.

A brief description of the role of the gas industry in air conditioning is presented with special reference to sponsored research at Battelle Memorial Institute. J. F. Reed

Newton, A. B. YOU CAN DO SUMMER AIR CONDITIONING. *Gas Heat*, 5, 29, 30, 76 (1954) June.

This is the first of several parts describing the step-by-step application of the National Warm

Air Heating and Air Conditioning Association Manual No. 11—"Design and Installation of Summer Air Conditioning for New and Existing Residences". The author gives a very lucid description of all phases of load calculation, etc., so that the heating dealer can enter this field and secure portion of this great market.

R. T. Ellington

Straub, H. E. INVESTIGATION OF AIR DISTRIBUTION IN ROOMS FOR ALL-YEAR AIR CONDITIONING. Preprint, Amer. Gas Assoc. Research and Utiliz. Conf., Cleveland (1954) June.

An outline of work done on project DGR-2-AC of the American Gas Association at the Univ. of Illinois. Problems in air duct design and air distribution studies are discussed. J. F. Reed

Burner Design

Weber, E. J. A GENERAL APPROACH TO BURNER DESIGN BASED UPON RESULTS OF AGA BURNER RESEARCH. *Gas*, 30, 41-44 (1954) July.

The characteristics required of gas burners are clearly stated, and the manner in which these various characteristics can be obtained by careful design is discussed. A brief review of AGA reports and bulletin points out the many difficulties involved, and the progress made in evaluating the effect of such factors as part geometry and part loading on combustion characteristics. Primary and secondary aeration are also discussed. E. F. Searight

Gas vs Electric Water Heating

Hebrank, E. F. EFFICIENCIES AND RECOVERY RATES ESTABLISHED IN COMPETITIVE WATER HEATER TESTS. *Gas*, 30, 53, 54 (1954) August.

The results of an extensive series of electric vs gas water heater tests are published, and significant data is discussed. The tests, prompted by the greatly increased use of household appliances using hot water, were sponsored by the AGA at the University of Illinois. Standby studies, maximum one and two hour delivery studies, daily usage studies, and automatic washer cycle studies were conducted. Five out of six gas heaters tested were able to supply four consecutive washer cycles, while only one of seven electric heaters was able to do so. The required input per cycle for the average gas heater was approximately 1.41 times that required for the average electric heater.

Publisher's Abstract

Water Heater Rental

LAKE SHORE, BLACKSTONE CLIMB ON WATER HEATER RENTAL BANDWAGON. *Gas*, 30, 55-58, 60, 62, 64 (1954) August.

By initiating a water heater rental program, several eastern utility gas companies have stimulated appliance sales and increased line load. This article relates the problems encountered, methods used to solve these problems, and subsequent benefits derived by two specific concerns in their recent adoption of such a plan. Sales promotion ideas, methods of financing, and installation suggestions are dealt with in considerable detail. Publisher's Abstract

Range Servicing

Thomas, W. B. SERVICING THE MODERN GAS RANGE. PART I. *LP-Gas*, 14, 55-57 (1954) August.

A description is given of the dual burner system, manifold, and various other parts of a typical modern gas range. Information is given for better installation and servicing. The advantages of this proper installation and servicing, plus a thorough explanation of the ranges operation are stressed. R. Parker

Solar House Heating

Heywood, H. SOLAR ENERGY FOR WATER- AND SPACE-HEATING. *J. Inst. Fuel* (British) 27, 334-352 (1954) July.

This comprehensive paper describes the solution of many of the technical problems involved in the application of solar radiation to domestic water-heating and space-heating of buildings. The absorbers used on the continent and in the USA for various tests are described in detail.

R. T. Ellington

3. COMBUSTION AND INDUSTRIAL FURNACES

Air Pollution

McCabe, L. C. ATMOSPHERIC POLLUTION. *Ind. Eng. Chem.*, 46, 105A-107A (1954) June.

A new thermal precipitator designed for sampling bacteria but useful in air pollution studies is described and data on performance of fabric dust collectors are discussed. D. M. Mason

McCabe, L. C. AIR POLLUTION REVIEW 1949-1954. *Ind. Eng. Chem.*, 46, 1646-50 (1954) August.

Important advances made by current research in the study of air pollution are described. Air pollution characteristics of several American cities and the British Isles together with the more important causes and the reduction of atmospheric pollution in some of these areas are discussed. Forty-seven references are given.
D. J. Dennison

Heat Treating

Trinks, W. THE HEATING OF STEEL. *Ind. Heating*, 21, 1082-4 (1954) June.

W. Rieman's 1953 article in *Stahl & Eisen* on the high speed heating of steel is reviewed and the permissible rate of heating various steels is brought out. R. T. Ellington

MALLEABLE IRON ANNEALING FURNACES CONVERTED TO NATURAL GAS FIRING FOR IMPROVED OPERATION. *Ind. Heating*, 21, 1114, 1116 (1954) June.

The improvements in operation, such as cleanliness, 24-hr. reduction in firing cycle, better temperature control and better metallurgical properties secured by conversion to gas are brought out. R. T. Ellington

Industrial Drying

Stix, N. GAS FIRED UNIT HEATER ACCELERATES STAIN DRYING ON SHOE SOLES. *Ind. Heating*, 21, 1377-8 (1954) July.

Improved operation and 75% reduction in drying time secured with controlled temperature air supplied by gas-fired unit heaters is described. R. T. Ellington

GAS IN CONFECTIONERY. *Gas World* (British) 139, 10-13 (1954) July 17.

This article presents a very good description of the operations in candy making and points out many operations in which gas heat is useful. It would be good source material for the sales engineer looking for prospects in the confectionery industry. R. T. Ellington

Sterilizer

Sharpe, B. M. STERILIZING GERM-CONTAMINATED AIR BY DIRECT HEATING. *Ind. Heating*, 21, 745-46, 48, 50, 52 (1954) April.

Sterilization of germ-contaminated air exhausted from a pharmacological laboratory before discharging it to the outside atmosphere is a must. A direct-fired pull-through air heater is used to heat the air to 650° F. to insure complete destruction of all germs.
R. T. Ellington

Vapor-Phase Engine Cooling

Harbert, L. C. HOW LARGE GAS COMPRESSORS UTILIZE VAPOR PHASE ENGINE COOLING. *Gas*, 30, 91, 92, 94-96, 98, 101, 102 (1954) August.

The advantages of and methods used in cooling large gas engine-driven compressors and generators at elevated jacket-water temperatures are discussed in considerable detail. Cooling in this manner, above the dew point of combustion gases, eliminates condensation in the cylinders and prevents acid formation. Advantages resulting directly include: uniform coolant temperatures at all speeds and loads, controlled by the natural law of boiling; faster warm-up; increased mechanical efficiency; reduced oil sludge; greatly reduced cylinder wear. Thermal circulation and allied problems are studied from the standpoint of efficiency and equipment required. Publisher's Abstract

Waste Gas Heat Recovery

Ruff, R. J. GAS CLEARS THE AIR. *Gas*, 30, 48-51 (1954) August; *Ind. Heating*, 21, 1583-84, 86, 88, 90, 92, 1660 (1954) August.

The author describes the catalytic combustion process and discusses its application to various types of industrial heating installations. Primary purposes of the process are the reduction

of atmospheric contamination and the utilization of gases having energy concentrations below the lower limit of flammability. The three design factors of gas volume, temperature, and fume energy concentration are related to specific heating operations, and sample calculations of values involved are given. Methods for selecting the proper type system, determining heating costs, and estimating potential recovery are outlined, and examples are given where continuous fume preheating is required, where initial preheating only is necessary, and where no preheating is needed. Self recuperative systems are currently in operation having capacities to 25,000 scfm, and a unit of 40,000 scfm is presently under construction. Publisher's Abstract

Water Cooling Restrictions

URGES "DEMAND CHARGE" FOR AIR CONDITIONING WATER. *Heating, Piping and Air Conditioning*, **26**, 97 (1954) August.

The unrestricted use of water for air conditioning purposes has become a national problem that requires action. The Northern Illinois Water Corp. has a proposed demand charge on unconserved water to apply to units of 3 tons and larger before the Illinois Commerce Commission. Similar situations are bound to arise in other states. R. T. Ellington

Weed Burning by Propane

Strawn, R., Jr. WEED CONTROL BY FLAMING. *LP-Gas*, 14, 56, 58 (1954) July.

Weed growth in ditches and along right-of-ways represents a nuisance and definite money loss in many instances. Waterborne weed seeds often account for 80% of weed growth in irrigated fields, and weed eradication often costs as much as $45 per acre. In such cases weed control along water channels can save the farmer as much as $10-$20 per acre. The most efficient procedure is to make one flaming pass to kill the weeds, allow 2-6 weeks to pass while sunlight does 70% of the job of dehydration and follow this with a second flaming pass. The Santa Fe has found that relative costs for right-of-way clearance are $75 per mile for chemicals, $54 for heavier fuel oils and $20 for propane gases. Other advantages secured by using propane are given. R. T. Ellington

4. CARBONIZATION AND GASIFICATION

Carbonization Economics

Minet, R. G., Smith, H. B., Jr. and Trilling, C. A. ECONOMICS OF COAL CARBONIZATION BY THE LOW-TEMPERATURE PROCESS. *Chem. Eng. Progress*, 50, 342-347 (1954) July.

An engineering economic study upon a proposed fluidized low-temperature carbonization process operating on a plant-scale of 8,520 tons Ohio bituminous coal per day shows reasonable promise of profit. The $11.5 million plant, designed for daily recovery of 200,000 gal. liquids, 6000 tons char, 15 MMCF gas and 67 tons sulfur promises 31% return on initial investment, when using conservative market values for liquid products, and fuel values for char pitch, and gas (before taxes). Higher grade uses of the latter 3 products on coke manufacture and power generation, electrode carbon, and utilities gas would afford increased profit, as would a lower coal price and added in-plant refining of byproducts. The process utilizes a fluidized pre-oxidizer (at 400° F.) for the raw coal, heated by 1200° F. gases from a char-fed heat generator just below, both vessels feeding a 3:1 blend of char and oxidized coal to the separate fluidized carbonizer. The efficiency of the cyclone dust-separators on the three vessels is a crucial factor, as it dominates the quality of the products, and the values assigned to them in this study. A bibliography of 24 items is cited. S. Hu

Coal Structure

Blayden, H. E. SOME RECENT WORK OF THE NORTHERN COKE RESEARCH LABORATORY. *Gas World* (British), 140 Suppl. 9-13, (1954) July 3.

Recent coordinated work with the British Coke Research Association is described. Intensive study of some 50 British coals by pyridine extraction shows a range of molecular weight in the soluble constituents of from 400-500 for coals below 20-25% volatile matter, to 1200 for coals up to 30% volatile. The presence of colloidally dispersed material (micelles) therefore was not likely in these extracts. Magnetic studies of coke and carbon gave further data on

a minimum magnetic susceptibility in carbons made at 700° C. carbonizing temperatures, anisotropic nature of graphite (44 times greater in direction normal to layer), negative temperature dependence of the susceptibility of graphites and high-temperature carbons, and positive temperature dependence of low temperature (600° C.) carbons, with paramagnetic behavior.

O. P. Brysch

Coal Gas Network

Symon, F. G. CENTRALISED CONTROL OF A GAS GRID. *Gas World* (British) **139**, 1550-57 (1954) June.

The integration of producing and distributing facilities to utilize the installations to most economic advantage is discussed. Examples of integrated grids are presented, with the method of operation.

B. E. Eakin

Wormsley, B. H. 6— A NATIONAL GAS GRID. *Gas World* (British) **140**, 504-06-510 (1954) August.

This article outlines a proposed gas distribution network based on production from plants situated in the coal fields. The area involved includes most of England south of Blackpool. The calculations are not an exact economic or design study, but merely to show the relative cost of such a system and the anticipated saving which would accrue from a national grid.

B. E. Eakin

Coal Gasification

Atwell, H. V. (assigned to The Texas Co.) METHOD FOR PARTIAL COMBUSTION OF CARBONACEOUS MATERIALS. U. S. 2,681,-852 (1954) June 22.

Special apparatus is designed for gasifying pulverized coal to synthesis gas, embodying the introduction axially of an oxygen-coal suspension at one end of the reactor, with steam introduced peripherally at the other end. This produces in a change in direction of the product gas flow at the point of steam introduction, resulting in countercurrent flow and permitting improved heat exchange between the endothermic gasification zone and the exothermic partial combustion zone. C. G. von Fredersdorff

Garbo, P. W. (assigned to Hydrocarbon Research, Inc.) GASIFICATION OF CARBONACEOUS SOLIDS. U. S. 2,683,657 (1954) July 13.

An improved fluidized gas-solid contacting vessel is proposed incorporating a system of vertical baffles in the upper and lower sections thereof which prevent substantial backmixing of solids and increase the heat exchange efficiency. C. G. von Fredersdorff

Gorin, E. (assigned to Pittsburgh Consolidation Coal Co.) GASIFICATION OF CARBONACEOUS SOLIDS. U. S. 2,682,458 (1954) June 29.

A two stage fluidized gasification system is proposed which is designed to process pulverized solids consisting of all size ranges with no required pre-screening of the fuel charge. The pulverized fuel is charged to the first vessel where the inlet gas velocity is quite high to maintain fluidization of the larger fuel size fractions. This causes rapid elutriation of the fines, and the exit gas containing these fines is admitted to the second fluid gasification vessel, which operates at a reduced gas velocity to maintain the fines in a fluid condition, thereby greatly reducing the carry-over losses.

C. G. von Fredersdorff

Gorin, E. (assigned to Pittsburgh Consolidation Coal Co.) GASIFICATION OF CARBONACEOUS SOLID FUELS. U. S. 2,682,455 (1954) June 29.

The patent refers to a new method of solid fuels gasification via carbon dioxide acceptors, in which mixtures of carbonaceous materials and metal oxides such as those of calcium, barium or strontium are reacted with steam to produce fuel gases or synthesis gases either rich in hydrogen or rich in methane, depending on the operating temperature and pressure. In this process the carbon dioxide normally produced in gasification combines with the metal oxides, yielding a gas of low carbon dioxide content. These oxides, as well as other catalysts which may be added to the fuel, can cause an increase in the water-gas shift reaction, thereby increasing the final H_2:CO ratio of the make-gas. Increased methane contents may be obtained by further increasing the operating pressure or by

adding certain other catalysts. In removing carbon dioxide, the metal oxides form the corresponding carbonates, which can be subsequently regenerated by air oxidation of the residual carbon in the fuel, and suitable vessel design could be provided for the simultaneous separation of the fuel ash from the regenerated metal oxides. Carbon dioxide removal by metal oxides is highly exothermic and conditions can be selected to balance the endothermic steam-decomposition reaction, thus reducing the gasification step to a thermally neutral or even slightly exothermic condition.

C. G. von Fredersdorff

Mennicken, J. G. PRODUCTION DE GAZ DE DISTRIBUTION A LONGUE DISTANCE PAR LE PROCEDE "LURGI" DE GAZEFICATION SOUS PRESSION. (PRODUCTION OF GAS FOR LONG-DISTANCE DISTRIBUTION BY THE LURGI PRESSURE GASIFICATION PROCESS). *Rev. Générale du Gaz* (Belgium), 76, 91-96, 97-100 (1954) May-June.

Among significant recent applications of gasification under pressure are a) the installation of 20 MMCF/day capacity Lurgi units operating at 28 atmospheres at Melbourne, Australia, b) a 7 MMCF/day Lurgi installation at Daud Khel, Pakistan utilizing high sulfur coal for the production of ammonium sulfate, c) a plant now under construction near Johannesburg, South Africa, comprising eight 12-ft diameter Lurgi generators of 100 MMCF/day total capacity, operating at 28 atmospheres and utilizing a high ash coal, and d) a Lurgi plant of 50 MMCF/day capacity to be constructed by Ruhrgas in Westphalia, Germany. The Lurgi generator represents the lowest oxygen consuming gasification process, requiring from 300 to 400 SCF oxygen/MM Btu, which is approximately 50% of the oxygen consumed in water-gas production by conventional methods. Yielding a purified gas up to 400 Btu/SCF and containing 10-15% CH_4 depending on the fuel employed, one principal advantage of the Lurgi pressure operation lies in the savings in compression costs of distribution in long distance pipelines. The author presents a comparison of theoretical and actual gas compositions as a function of temperature and pressure, and discusses the important fuel characteristics required for successful Lurgi operation. To increase the methane content of Lurgi gas from a given fuel it may be desireable to increase the operating pressure, to add a catalyst to the raw fuel or to add extraneous hydrogen to the system.

C. G. von Fredersdorff

Minchin, L. T. TOTAL GASIFICATION BY FIXED BED PROCESSES. *Coke and Gas* (British) 16, 235-40 June; TOTAL GASIFICATION BY POWDER METHODS. 277-282 (1954) July.

Papers presented at the Liége (Belgium) Conference on Total Gasification in May 1954 are reviewed. Use of oxygen, flow patterns of gasifiers, low pressure (Power Gas and Demag) producers, double gas (G. I. and Heurtey) generators, Lurgi high pressure, and Flesch-Demag periodic fluidization are discussed briefly. In the July installment, the powdered coal fluidized and suspension methods are reviewed. Brief discussion is given of the 1) Winkler, 2) Flesch-Demag, 3) Pandinco, 4) Koppers-Totzek, 5) Ruhrgas A. G., 6) Rummel, 7) B. Mines (du-Pont), 8) B. Mines Vortex, 9) B. Mines Texaco, 10) Pebble Lurgi-Ruhrgas, 11) Ruhrgas pulsating tube.

O. P. Brysch

Fermentation Gases

Schmidt, F. and Eggersgluess, W. PRODUCTION OF HIGH-POWERED GAS FROM AGRICULTURAL WASTES. *Gas Times* (British) 80, 147-149 (1954) August 6; *Gas J.* (British) 279, 286 (1954) August 4.

Plants have been developed and operated on German farms for producing methane gas by fermentation of farm wastes or other organic material. The largest of these has an average daily gas output of 23,000 cu ft, the gas having a normal content of 62 percent methane and 38 percent carbon dioxide with traces of nitrogen, oxygen, hydrogen and hydrogen sulfide. The gas is used for domestic appliances, powering tractors and generating electricity. Manure, straw, vegetable wastes and organic wastes of certain industries can be used in this so-called Bihugas process.

E. J. Pyrcioch

Foreign Gas Practise

West, J. F. CARBONISATION AND GASIFICATION IN TROPICAL AND SUB-TROPICAL REGIONS. *Gas World*, (British) 140,

261-263 (1954) July 31; *Gas J.* (British) 279, 282-83 (1954) August 4.

Statistics are presented showing operating results during 1952 for several gas manufacturing plants located in tropical and other climates. Santiago, Chile; Rio de Janiero, Sao Paulo and Santos, Brazil; Johannesburg, S. Africa; Tokio, Japan; and Hong Kong, China are discussed. Types and analyses of coals used, gas making capacity and by-products are among some of the factors considered. D. J. Dennison

JOHANNESBURG GASWORKS. *Coke and Gas* (British), 16, 259-65, July; 299-306 (1954) August.

Johannesburg, the industrial capital of the Union of South Africa with a population of 805,000 is supplied with coal gas and carbureted water gas. Glover-West continuous vertical retorts (78 in 4 benches) yield 5.1 million CF/day (16.3 MCF/ton) of coal gas from Transvaal and Natal coking coals. Two automatic carbureted water gas sets (Power Gas Corp. Ltd.) of 1.8 million CF/day capacity are provided. O. P. Brysch

Oil Gas

Stanier, H. PROCESS FOR PRODUCING COMBUSTIBLE GASES FROM HYDROCARBON OILS. U. S. 2,682,459 (1954) June 29.

Production of a combustible gas from hydrocarbon oils is claimed, using catalytic gasification with steam at high temperatures. Gas oil of 0.87 sp. gr. and boiling at 500° to 600° was gasified at 1650°-1750° F. over a catalyst composed of metal oxides (Al,Fe,Si, and Ca). Carbon deposition was high (40-45 wt. per cent) at low steam rates, and low at high steam rates. The gas, primarily methane and hydrogen, was of 550-570 Btu/SCF. W. G. Bair

Pitch Coke

Curran, M. D. METALLURGICAL COKE FROM PETROLEUM PITCHES. *Petroleum Eng.*, 26, C14-C16, C18 (Ref. Ann.) (1954) July 15.

Modern pitch coking equipment of the sole-heated type is described, with some operating data. As charging stock, pitches of 35% Conradson carbon or higher are recommended. O. P. Brysch

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Adsorption Storage

Weisz, P. B. (assigned to Socony-Vacuum Oil Co. Inc.) METHOD OF GAS STORAGE. U. S. 2,681,167 (1954) June.

The storage of gas by adsorption on silica-gel, or a similar base, at substantially atmospheric pressure is described. It is claimed that a gas volume considerably greater than the volume of the container can be stored in this manner. The gas is desorbed by water displacement. B. E. Eakin

Basin Developments

Morrisey, N. S. SAN JUAN BASIN ACTIVITY SPURRED BY PROSPECT OF GAS PIPE LINE. *Oil Gas J.*, 53, 170-172 (1954) May.

The Pacific Northwest Pipeline Company's efforts to build a line have provided another spur to the drilling activity of the San Juan Basin. In 1953 there were 15 successful wildcats drilled out of 41, with 13 gas wells and 2 oil wells. Reserve estimates for the basin exceed 15 trillion cubic feet. The geological structure of the area, and the producing formation are discussed. The exploration outlook for the rest of 1954 is very favorable. B. E. Eakin

Mueller, E. L. IN THE WILLISTON BASIN GEOLOGY POINTS TO MAJOR OIL PROVINCE. *World Oil*, 139, 104-109-110-112 (1954) July.

The Williston basin possesses all of the geological factors necessary to make it a major oil-producing area. Generalized geologic maps are presented along with examples of the rapid stratigraphic changes frequent to this basin. A very sharp rise in wildcat drilling is evident this year, reflecting improved operating conditions and better seismic coverage of the area. B. E. Eakin

British Exploration

THE SEARCH FOR NATURAL GAS IN GREAT BRITAIN. *Gas Times* (British), 80, 25, 26, 28 (1954) July 9.

Due to the increased cost and continuing scarcity of coal suitable for gas making, the Gas

Council in 1952 initiated a geophysical search for sources of natural gas. The results to date are not very encouraging, altho small deposits are known to exist in the south midland areas.
B. E. Eakin

Compressor Problems

Worster, A. R. THE IMPORTANCE OF MAINTAINING PROPER VALVE LIFT ON COMPRESSOR VALVES. *Gas*, 30, 112, 114, 116 (1954) August.

The author stresses the importance of maintaining correct valve lift, and discusses the factors which determine the design lift. Under internal factors are listed the general valve type, the spring type, and the type of cushion used. The external, or uncontrollable factors, include rotative speed, air speed, pressures, compression ratio, gas characteristics, and line pulsations. The bad effects of increasing the valve lift unintentionally during the valve maintenance work, and the problem of valve flutter are studied.
Publisher's Abstract

Communications

Chapman, F. GAS COMPANIES FLOCK TO RADIO TO IMPROVE SERVICE, CUT COSTS. *Gas*, 30, 37-41 (1954) August; PIPELINE COMMUNICATIONS AND ELECTRONICS. *Gas*, 30, 118, 120, 123 (1954) August.

The author reports on a recent nationwide survey of major gas distribution and transmission companies on the use of radio for improved service. Past, current, and predicted expenditures for both mobile radio units and microwave radio equipment are carefully analyzed and represented graphically. The advantages and applications of each type for extensive communication, telemetering, and remote control are discussed. The results from the 35 million dollars presently invested, satisfied customers and increased appliance sales, are pointed out and related to the companies' future policies.
Publisher's Abstract

Condensate Removal

Atkinson, R. G. (assigned to Phillpps Petroleum Co.) RECOVERY OF NATURAL GAS CONDENSATE. U. S. 2,683,972 (1954) July 20.

An apparatus is described for the removal of moisture and condensible hydrocarbons at the well-head, utilizing cooling obtainable through pressure reduction at the separator. The process utilizes the formation of hydrates as a removal system.
B. E. Eakin

Field Practise

Doll, H. G. and Martin, M. HOW TO USE ELECTRICAL LOG DATA TO DETERMINE MAXIMUM PRODUCIBLE OIL INDEX IN A FORMATION. *Oil Gas J.*, 53, 120-26 (1954) July 5.

A method is described whereby the Maximum Producible Oil Index, i.e. the amount of oil per unit volume of reservoir formations which is displaced by mud filtrate, can be determined from electrical log data, by means of a very simple formula which does not imply the knowledge of formation factor, or porosity, or residual oil saturation. Charts are provided for the computation of the Maximum Producible Oil Index in barrels of oil per acre-foot.
Authors' Abstract

Doll, H. G. and Martin, M. NUMERICAL EXAMPLES OF ELECTRIC-LOG EQUATIONS: FIFTEEN PRACTICAL FIELD CALCULATIONS. *Oil Gas J.*, 53, 126-29 (1954) July 5.

Some of the equations developed in the article on electric log determination of the maximum producible oil index are discussed. The numerical methods of solution for these equations are explained, and examples of the calculations shown.
B. E. Eakin

Fuller, L. S. DRILLING WITH AIR AND NATURAL GAS. *Petroleum Eng.* 26, B-87-B-90 (1954) Reference Annual, July 15.

El Paso Natural Gas Company's experience with air or gas drilling in the San Juan Basin is summarized. The most important benefits of such drilling are cited as follows: 1) faster drilling rates and less clean-out time, 2) no contamination of the producing zone, 3) testing of low-pressure zones is made possible.
R. F. Bukacek

Howard, G. C., Scott, P. P., Jr. PLUGGING OFF WATER IN FRACTURED FORMATIONS. *J. Petroleum Techn.* 6, 21-26 (1954) July.

The use of a kerosene-cement slurry to effect

the plug-off of a water producing zone by selective setting has been evaluated both in the laboratory and in the field. The process has obtained fair results, and has proved capable of shutting off water without permanently affecting oil production. The cement slurry is removed from the oil zone by acidizing, the water-zone set cement being impermeable to the acid. B. E. Eakin

Flow Measurement

Hull, J. and Tricebock, D. ROTAMETERS. *Chem. Eng. Costs Quarterly*, 4, 68-67 (1954) July.

The fundamentals of rotameter operation and application of fluid flow measurement are presented. The article covers rotameter principles, indirect indicating devices, and remote recording or indicating devices, installations, and costs of typical units. B. E. Eakin

Nickel, E. EMPIRISCHE ERMITTELUNG DER DURCHFLUSSZAHL *a* AN EINER BLENDE. (EMPIRICAL DETERMINATION OF THE DISCHARGE COEFFICIENT *a* OF AN ORIFICE.) *Gas- und Wasserfach* (German), 95, 344-348 (1954) June 1.

Orifice meter discharge coefficients for radius taps were determined using square-edged orifice plates against a standardized meter and a meter-prover. The effect of fouling is demonstrated. C. G. von Fredersdorff

Fluid Flow

Baker, O. SIMULTANEOUS FLOW OF OIL AND GAS. *Oil Gas J.*, 53, 185-190, 192, 195 (1954) July 26.

A report of work done by Magnolia Petroleum Company on two-phase flow in pipelines. A number of modifications of the Lockhart-Martinelli correlation are proposed, and a discussion of calculation procedures and the economics of piping liquids and gases in the same pipe is included. R. F. Bukacek

Gas Purification

McLaughlin, R. B. and Wenstrand, L. PERMIAN'S CO_2 PLANT NOW IN OPERATION. *Petroleum Eng.*, 26, 24-28 (1954) July.

A brief description of Permian Basin Pipeline Company's plant, designed to remove up to 30% CO_2 from 25 MMCF per day of residue gas. Ultimate capacity of the plant will be 150 MMCF per day. R. F. Bukacek

Phillips, I. H. (assigned to Humphreys and Glasgow Ltd.) CONTINUOUS PROCESS FOR THE REMOVAL OF HYDROGEN SULFIDE FROM GAS. U. S. 2,682,444 (1954) June 29.

A continuous moving bed process for iron oxide purification is described in which the iron oxide moves progressively downwards through the purification chamber, and revivification of the sulfided oxide is accomplished by contacting the oxide with oxygen-containing gas in a conduit forming the conveyer or elevator transporting the material to the top of the purifying chamber for re-use. Apparatus combining these two functions may be endless conveyers of the drag-link, scraper, or chain type, or may be such that an air stream is used both for elevation and for revivification. D. M. Mason

Liquefied Storage

Wilkinson, W. (assigned to Air Reduction Co., Inc.) STORAGE OF LIQUEFIED GASES. U. S. 2,682,154 (1954) June 29.

An improvement is claimed in the storage of liquefied gases by employing heat exchange between the liquid drawn of the tank for use and the vapor which would normally be vented from the top of the tank due to atmospheric heat leak thereby reliquefying the vented vapor for return to storage. J. M. Reid

Loads and Design

Gary, J. F. THE EFFECT OF HEATING LOADS ON THE DESIGN OF A DISTRIBUTION SYSTEM. *Gas*, 30, 45-47 (1954) August.

Problems confronting the Seattle Gas Co. in its five year load increasing program are presented and various solutions are studied. The increase, to be built initially on domestic heating and interruptible industrial loads, is expected to result in an annual thermal load of six times the current load. Existing systems of high and low pressure mains are carefully evaluated, and proposed additions and conversions are analysed. The question of adding district regulators is dealt with at length.

Publisher's Abstract

Odorants

McKinley, R. W., Larratt, A. E. (Arthur D. Little, Inc.) STUDY OF COMMERCIAL ODORANTS FOR NATURAL GAS. Final Rept., Am. Gas Assoc. Research Project PF-7 (1954) March. 36 pp. $1.00

The objective of this investigation was to describe, by using olfactory methods, the odor properties of seven commercial odorants at various concentrations. The procedure by which the objective was reached included three phases: first, the development of specifications for the odor test room in which to examine the odorants; second, the determination of odor levels, threshold, recognition and warning; third, the use of the natural gas odorants' odor character versus various concentrations as a criterion of their effectiveness as warning agents. This report covers the methods involved and the results obtained from the project during the period from January, 1953, to December, 1954. Authors' Abstract

Offshore Conservation

Linz, B. F. GEOLOGICAL SURVEY LOOKS TO SEA. *Oil Gas J.* 53, 108-09 (1954) Aug.

The U. S. Geological Survey, the government watchdog on natural resources including gas and oil, is preparing for an offshore oil boom which may bring greater revenue than leases on all other public land. The U.S.G.S. will assume the burden of enforcing conservation rules on outer Continental Shelf bases. The operation of the agency, and its work is outlined, as well as its branch office locations and personnel. B. E. Eakin

Peak Load Gas Control

Schmidt, E. X. (assigned to Cutler-Hammer, Inc.) PEAK SHAVING GAS MIXING CONTROL SYSTEM. U. S. 2,682,884 (1954) July 6.

A mixing control system is described for normally providing a fixed volumetric proportion of peak load gas to base gas but which will respond automatically to failure in the base gas supply providing any proportion of peak load gas up to 100% depending on the requirements. Provisions are made to automatically adjust the heating value of the peak load gas to give satisfactory combustion in appliances depending on the proportion of substitution. J. M. Reid

Pipe Line Planning

Boyd, J. W., Richardson, J. O. and Roach, D. A. PROPANE TRANSPORTATION AND STORAGE ON A PRODUCTS PIPE LINE SYSTEM. *Petroleum Eng.* (Ref. Ann.) 26, D26, D28-D30 (1954) July 15.

Phillips Pipe Line Company is regularly transporting propane as a finished product in its 950-mile, Borger, Texas, to East Chicago, Indiana, Products Pipe Line. Individual tenders run from 25,000 to 55,000 bbl. The physical properties of propane, such as high vapor pressure, low specific gravity, high compressibility and high purity necessary for sale, pose special line problems. High seasonal variations in demand cause additional difficulties. All storage is owned by the shipper and these facilities include conventional above-ground storage, and mined underground storage. Pumping equipment consists of conventional centrifugal pumps with mechanical seals. Station backpressures must be closely watched to keep the propane in a liquid state at all times. The critical product specification of residue is maintained in this pipe line by the use of butane buffers and proper scheduling of products. The specification of dryness is not a problem as all products are dehydrated at point of entry into the pipe line. It is believed that propane transportation by pipe lines that connect large sources of LPG with concentrated markets will increase in the near future, providing certain obstacles can be overcome. Authors' Abstract

Newby, A. B. WHAT EARTHQUAKES DO TO PIPE LINES. *Gas Age*, 114, 37-38 (1954) July 15.

The 1952 and 1954 earthquakes in the San Joaquin Valley in California resulted in no failure in the gas distribution, and few breaks in the welded transmission lines. These experiences show the need for emergency operating centers for each company and for each operating division. Emergency operating procedure is essential to maintain efficient manpower utilization in a crisis. B. E. Eakin

Niederschuh, E. UNTERSUCHUNG UEBER DIE FERNGASVERSORGUNG UEBER SEHR GROSSE STRECKEN. (INVESTIGATION OF GAS SUPPLY OVER VERY LONG

DISTANCES). *Gas- und Wasserfach* (German), 95, 146-54 (1954) March 1.
The problem of optimum pipeline pressure is analyzed for a line with one compressor station at inlet and various arrangements of tap locations. Expansion turbines at discharge points provide power economy. As head line pressure is increased, it may be shown that net power requirement for a given flow and line size becomes a minimum at a certain head pressure, and this minimum is the criterion for the author's optimum design. Other economic factors and their influence are discussed in a general way. P. R. Trumpler

SAN JUAN GAS TO SERVE NORTHWEST. *Gas Age*, 114, 29-31, 74, 75 (1954) July 15.
The Federal Power Commission has authorized Pacific Northwest Pipeline Corp., Houston, Texas, to construct a 160 million dollar, 1466 mile pipeline, from the San Juan basin thru Colorado, Utah, Wyoming, Idaho, Oregon, and Washington. The line will have 106 miles of supply laterals, 327 miles of sales laterals and 14 compressor stations. Market estimates indicate sale of 92,582 MMCF of gas in the first year, with a third year estimate of sale of 122,292, MMCF. The maximum day firm sales in the first year is estimated at 2231.3 MMCF, and at the end of three years as 319.3 MMCF. Gas supply reserves are estimated at 3.667 trillion cubic feet. B. E. Eakin

Pipeline Protection

Goodwin, C. J. EFFECT OF LIGHTNING OR ELECTRIC POWER FAULTS ON INSULATING JOINTS. *Gas* 30, 109, 110 (1954) August.
Part 4 of a series of 5 installments points out the importance of insulating pipeline joints in order to effectively apply cathodic protection and control corrosion. High voltage electrical surge arresters should be installed to protect these insulated joints. Several current and proposed methods of furnishing this protection are discussed. Publisher's Abstract

Pipe Line Testing

TESTING PROCEDURES: HYDROSTATIC TESTING OF GAS TRANSMISSION LINES. PART II. *Petroleum Eng.*, 26, D-19, D-36, D-38 (1954) July.
A discussion of the techniques and problems involved in hydrostatic test work. A considerable number of details are included. R. F. Bukacek

Pipe Line Temperatures

Schorre, C. E. FLOWING TEMPERATURES IN GAS PIPE LINES. *Pipe Line Industry*, 1, 94-97 (1954) July.

A method of calculation of temperature changes in a gas pipe line is presented which combines heat transfer and Joule-Thompson effects. The overall Joule-Thompson effect is obtained from a Molier diagram and added to the heat transfer effect. While the method is not strictly correct, it should give quite good results provided that the Molier diagram used corresponds to the gas in the line. R. F. Bukacek

Reforming

Mayland, B. J. (assigned to Phillips Petroleum Co.) SYNTHESIS GAS MANUFACTURE. U. S. 2,684,895 (1954) July 27.

Synthesis gas of 2:1 H2/CO ratio is produced continuously by partial combustion of natural gas in oxygen and subsequent reaction with steam in a pebble reactor having two chambers, the lower of which serves as a preheater for the incoming steam. C. G. von Fredersdorff

Reservoir Flow

Aronofsky, J. S., Jenkins, R., A SIMPLIFIED ANALYSIS OF UNSTEADY RADIAL GAS FLOW. *J. Petroleum Techn.* 6, 23-28 (1954) July.

A method is presented for calculating the well pressure history in a natural gas or high GOR "condensate" field. The solution for the differential equation for unsteady state radial gas flow thru porous media was obtained by a numerical method using an electronic computer. The results obtained are presented in a generalized form for engineering use, and are compared with those obtained by Bruce, et al, reported in a 1953 AIME paper.
An effective radius of drainage has been defined which permits the equation of steady state gas flow to be used to predict well pressures in gas reservoir depletion. An equivalent effective radius of drainage for liquid systems is defined, and the solutions for gas and liquid compared. B. E. Eakin

Nielsen, R. F. HOW TO CALCULATE UNSTEADY STATE FLOW. *Oil Gas J.* 53, 253-61 (1954) July.

The equations used in the calculation of unsteady state flow from a reservoir are developed for liquid compressibility in porous media. The method of solution of the equations are presented. The assumptions and restrictions for the equations are included.

B. E. Eakin

Sulfur Recovery

Tiehen, J. A. SILVERTIP, WYO., SULFUR PLANT IS ECONOMICAL, EFFICIENT. *Oil Gas J.*, 53, 86-92 (1954) July 19.

Operation of a plant recovering 45 tons per day of elemental sulfur is described.

D. M. Mason

Turbine Compressors

HOW UNITED'S FIRST TURBINE OPERATES. 114, 33-36; 82; 84 (1954) Aug.

A brief report of experience and the operating characteristics of United Gas Pipeline Company's new gas-turbine driven centrifugal compressor station. R. F. Bukacek

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Exploration Costs

OIL FINDING COST AT NEW PEAK LEVEL. *World Petroleum*, 25, 42-45; 60-62 (1954) July.

The cost of finding and developing new petroleum reserves has been increasing steadily. The exploration dollar found only 1.3 barrels of oil in 1953, against 8.9 barrels in 1936-38. Despite the increased cost of finding new reserves, the petroleum industry today has more than 231 million acres of prospective oil land under lease, embracing 32 states in the nation. Curves and data on exploration costs are presented.

B. E. Eakin

Fischer-Tropsch

Frye, C. G. (assigned to Stanolind Oil and Gas Co.) USE OF CARBON DIOXIDE IN HYDROCARBON SYNTHESIS. U. S. 2,684,975 (1954) July 27.

The use of carbon dioxide is recommended as a suppressor for methane formation with simultaneous increase in liquid products, particularly hydrocarbon acids in the Fischer-Tropsch synthesis. C. G. von Fredersdorff

Oil Fire Control

Downing, A. G. and Fassuliotis, W. AIR AGITATION TESTS IN ARABIA. *Nat. Fire Prot. Assoc. Quarterly*, 48, 61-68 (1954) July.

In order to evaluate the effect of air agitation upon tank fires in the crude oil produced and stored by the Arabian American Oil Company, the Safety Division of the Industrial Relations Department, in cooperation with the Engineering Division, conducted a series of tests involving the use of the air agitation principle upon burning low flash-point Arabian crude oil. 1) the rate of burning. 2) the rate of heat wave propagation. 3) the boilover properties. 4) the effect of air agitation upon the above characteristics. The investigation resolved that the Arabian crude oil tested in the presence of seven tenths of one per cent of water by volume had definite boilover characteristics. Agitation by air at rates of 0.02 and 0.10 cfm per square foot temporarily decreased the rate of burning. However, the crude oil continued to burn and the temperature of the tank contents increased rapidly until boilover occurred in about one half the time required for this action to take place in unagitated crude oil. Authors' Abstract

Production

SEVENTEENTH TECHNICAL CONFERENCE ON PETROLEUM PRODUCTION, OCTOBER 28-30, 1953. Pennsylvania State Univ. Mineral Inds. Expt. Sta. Bull. No. 62, pp. 1-131 (1954) $2.50.

This bulletin contains the following papers:

Dunning, H. N. and Haiso, L. LABORATORY EXPERIMENTS WITH DETERGENTS AS WATER-FLOODING ADDITIVES.

Ojeda, E., Preston, F. and Calhoun, J. C. CORRELATION OF OIL RESIDUALS FOLLOWING SURFACTANT FLOODS.

Stewart, W. C. and Nielsen, R. F. PHASE EQUILIBRIA FOR MIXTURES OF CARBON DIOXIDE AND SEVERAL NORMAL SATURATED HYDROCARBONS.

McConnell, E. B., Jr. SELF-POTENTIALS OF RESERVOIR SANDS.

Licastro, P. H. and Griffiths, J. C. THE EFFECT OF SOLVENT EXTRACTION ON THE DETERMINATION OF POROSITY BY SATURATION.

Holmes, C. R. PROGRESS IN ELECTRIC LOGGING RESEARCH AT THE PENNSYLVANIA STATE COLLEGE DURING 1952-53.

Killins, C. R., Nielsen, R. F. and Calhoun, J. C. CAPILLARY DESATURATION AND IMBIBITION IN POROUS ROCKS.

Emery, J. R. and Griffiths, J. C. RECONNAISSANCE INVESTIGATION INTO RELATIONSHIPS BETWEEN BEHAVIOR AND PETROGRAPHIC PROPERTIES OF SOME MISSISSIPPIAN SEDIMENTS.

Preston, F. W. and Hazen, R. D. FURTHER STUDIES ON HEAT TRANSFER IN UNCONSOLIDATED SANDS DURING WATER INJECTION.

Jones-Parra, J., Stahl, C. D. and Calhoun, J. C. A THEORETICAL AND EXPERIMENTAL STUDY OF CONSTANT RATE DISPLACEMENTS IN WATER WET SYSTEMS.

Breston, J. N. and Pearman, B. R. HOT WATER INJECTION TREATMENT OF WELLS TO INCREASE WATER INTAKE RATES.

Residua Utilization

Padovani, C. (Editor) UTILIZZAZIONE DEI RESIDUI DI DISTILLAZIONE DEL PETROLIO. (RECENT ADVANCES IN FUEL TECHNOLOGY: UTILIZATION OF PETROLEUM DISTILLATION RESIDUES. *Revista dei Combustibili*, (Italian) 8, 454-57 (1954) June.

Vacuum distillation, coking, visbreaking and propane extraction are briefly discussed as applied to residual oils. The article mentions some American activities at Socony Vacuum Oil Co., Surface Combustion Corp. and the Institute of Gas Technology, stating that the Institute of Gas Technology has conducted studies on a pilot plant for gasification of distillate oils as well as of residues at 927° C. with catalysts in fluid phase. These processes present a better control of the carbonaceous deposit and help to solve the problem of handling very heavy oil. S. Sensi

7. ANALYTICAL METHODS AND TESTS

Aromatic Rings

Hazelwood, R. N. DETERMINATION OF RING CONTENT OF AROMATIC PETROLEUM FRACTIONS. *Anal. Chem.*, 26, 1073-76 (1954) June.

Equations have been derived to express the ring content and carbon distribution of aromatic petroleum concentrates from the readily measured physical properties of molecular weight, density, and refractive index. The n-d-M method of Van Nes and Van Weston is more precise for the majority of petroleum products, but gives erratic results when applied to aromatic concentrates. Though not intended for use with concentrates having a number of aromatic rings less than 0.9, a total number of rings less than 1.2, or for alkyl aromatics, the method described in this paper fills a need for a procedure which can be applied to petroleum aromatics with results whose deviations from known concentrates are comparable to those of the specific dispersion method and others involving more elaborate experimental data. A. J. Tulis

Carbon and Hydrogen

Johansson, A. VOLUMETRIC DETERMINATION OF CARBON AND HYDROGEN IN ORGANIC MICROCOMBUSTION ANALYSIS. *Anal. Chem.*, 26, 1183-50 (1954) July.

This volumetric determination avoids the error in weighing small amounts of CO_2 and H_2O in comparatively large glass vessels. The H_2O formed during combustion is absorbed in a methanol-pyridine mixture and determined by a Karl Fischer tetration. The CO_2 is absorbed in an aqueous solution of NaOH and $BaCl_2$, the precipitated $BaCO_3$ converted to the iodate and determined iodometrically. D. J. Dennison

Gas Analysis

Everett, A. J. and Minkoff, G. J. THE ANALYSIS OF COMBUSTION PRODUCTS. III. THE EFFECT OF HYDROGEN PEROXIDE ON THE REACTION OF POTASSIUM PERMANGANATE WITH ORGANIC PEROXIDES IN ACID SOLUTION. *Anal. Chim. Acta*, 11, 48-53 (1954) July.

Although methyl and ethyl hydroperoxides alone do not react with potassium permanganate

in acid solution at room temperature, they can be oxidised by this reagent in the presence of hydrogen peroxide. The apparent equivalents (as compared with hydrogen peroxide) are much lower than usual but, in the presence of excess hydrogen peroxide, the titre due to the organic peroxide is proportional to its original concentration. This forms the basis of a simple titration method which, though empirical, is both rapid and accurate. Since t-butyl hydroperoxide does not react in this way, it may be possible to differentiate the higher peroxides from lower peroxides. Authors' Abstract

Gas Analysis

Guild, L. V. GAS ANALYSIS PIPETTES. U. S. 2,684,289 (1954) July 20.

An automatic valve for bubbler-type absorption pipettes used in gas analysis is described. A small valve chamber from which the liquid absorbent drains completely is an advantageous feature of the design. D. M. Mason

Hydrogen Determination

Guldner, W. G. and Beach, A. L. GASOMETRIC METHOD FOR DETERMINATION OF HYDROGEN IN CARBON. *Anal. Chem.*, **26**, 1199-1202 (1954) July 20.

The method involves the combustion of the carbon in a low pressure of oxygen wherein the hydrogen is converted to water, the separation of the water vapor from the carbon dioxide and excess oxygen by selective freezing, and the measurement of the water vapor in the gas phase by means of a calibrated closed-end manometer. Apparatus details are shown by diagram. D. J. Dennison

Nitrogen Determination

Beet, A. E. A MODIFIED UNIVERSAL SEMI-MICRO KJELDAHL METHOD FOR THE DETERMINATION OF NITROGEN IN COAL AND OTHER CARBONACEOUS MATERIALS. *J. Appl. Chem.* (British), **4**, 373-383 (1954) July.

A method is described in which an unmistakable color indication is given of the completeness of conversion into ammonium sulphate. Crystalline potassium permanganate replaces the usual catalysts as an oxidant and digestion is complete in about 13 minutes; the distillation, about 8 minutes. D. J. Dennison

Sulfur Determination

Sijderius, R. A METHOD FOR THE TITRIMETRIC DETERMINATION OF SULFATE USING THE DISODIUM SALT OF ETHYLENEDIAMINE - TETRA - ACETIC ACID. *Anal. Chim. Acta* **11**, 28-32 (1954) July.

The sulfate is precipitated with a known excess of barium chloride and the excess, after standing overnight, is titrated with the reagent. The method agrees well with the gravimetric method. D. J. Dennison

Sulfur in Oils

Battles, W. R. RAPID LAMP METHOD FOR DETERMINATION OF SULFUR IN HEAVY PETROLEUM DISTILLATES FEATURING A NOVEL AND MORE EFFICIENT ABSORBER. *Petroleum Eng.*, **26**, C58, C60, C61 (1954) June.

The improved apparatus extends application of the method to heavy distillates. The method employs an iodine solution for absorption of sulfur dioxide, followed by titration of the acid resulting from solution of the sulfur oxides and from oxidation of sulfur dioxide by iodine. (See also Gas Abstracts 10, 32 (1954).)

D. M. Mason

Erickson, H. J. and Lindberg, R. E. UNIT CUTS SULFUR ANALYSIS TIME BY 94%. *Petroleum Processing*, **9**, 1087-1088 (1954) July.

A method requiring about 20 min. for determining sulfur in petroleum products of low volatility, such as crude oil distillates and residual fuels, is described. The sample is burned in a stream of oxygen in a combustion tube in a Globar-type furnace, and the resulting SO_2 is determined by iodate titration.

D. M. Mason

Hopkins, C. H. IMPROVED "UNIVERSAL" LAMP SULFUR APPARATUS OFFERS WIDER SAMPLE RANGE, CLOSER CONTROL. *Petroleum Processing*, **9**, 1056-1058 (1954) July.

Improved apparatus for the determination of sulfur in petroleum products is described. With this modification of the ASTM lamp method a wide range of petroleum products, from LP-gas through medium gas oil, can be burned with smoother and better controlled operation.

D. M. Mason

8. GENERAL AND PHYSICAL CHEMISTRY

Argon Properties

Beattie, J. A. and Julin, H. P. DENSITIES OF GASEOUS ARGON. *Ind. Eng. Chem.*, **46**, 1668-9 (1954) August.

The increased industrial use of argon has indicated the need for a table of densities of gaseous argon of sufficient accuracy for determining the argon content of cylinder gas. The densities are tabulated for the temperature range of —40° to +130° F., and a pressure range of 0 to 3600 psig. The constants of the Beattie-Bridgeman equation of state for argon employed in the computations, the virial parameters for each temperature, and the densities, are tabulated.

B. E. Eakin

THE MIGHTY ATOM PLAYS A NEW ROLE IN LEAK DETECTING. *Gas News*, **17**, 6-8 (1954) August.

Radio-active argon 41 is used to detect and trace leaks in underground storage facilities. Argon 41 decays so fast that if any could reach the surface it would not be as active as the luminous dial on a watch.

R. R. Amrine

Carbon Structure

Austin, A. E. and Hedden, W. A. GRAPHITIZATION PROCESSES IN COKES AND CARBON BLACKS. *Ind. Eng. Chem.*, **46**, 1520-1524 (1954) July.

Calculations from data obtained in the x-ray diffraction of cokes and carbon blacks showed that the crystaline size, both in the *a* and *c* direction increased with decrease in their respective parameters indicating that the graphitizing of coke results in a more orderly stacking of the crystals and also in an increase in the dimensions of the layer crystals. Furthermore the presence of oxygen would cause an opposite effect by increases in the porosity in the crystals.

S. Mori

Catalytic Metals

Kehrer, V. J. and Leidheiser, H., Jr. THE CATALYTIC DECOMPOSITION OF CARBON MONOXIDE ON LARGE METALLIC SINGLE CRYSTALS. *J. Phys. Chem.*, **58**, 550-5 (1954) July.

Large spherical metallic single crystals were used to determine the relationship between structure of the crystal faces and their catalytic activity. Carbon deposition from catalytic decomposition of carbon monoxide served to show the active faces. The carbon pattern was photographed and an orthrographic projection normal to a major plane was superimposed to permit location of the minor active planes. Results show that minor plane faces decomposed CO very rapidly while major faces as the (100) plane in the face center cubic and the (0001) in the hexagonal system showed very little catalytic effect. Iron, nickel, and both cubic and hexagonal cobalt showed these properties while other metals such as copper, silver, chromium, molybdenum, palladium, and rhodium showed no catalytic reactivity.

S. Mori

Charcoal Adsorption

Dacey, J. R. and Thomas, D. G. ADSORPTION ON SARAN CHARCOAL: A NEW TYPE OF MOLECULAR SIEVE. *Faraday Soc. Trans.* (British), **50**, 740-748 (1954) July.

Adsorption studies on *Saran*, carbonized to charcoal, using liquid N_2, H_2O, He, and normal and isoparaffins were completed to determine the characteristics and size of the pores. Results show that these pores are of the order of 10-20 Angstroms, with a possibility of narrow constrictions inside.

S. Mori

Chemical Equilibrium

Corrigan, T. E. CHEMICAL FUNDAMENTALS: CHEMICAL EQUILIBRIUM-III. *Chem. Eng.*, **61**, 202, 204, 206, 208, 210 (1954) May.

Several examples are given in calculating maximum or equilibrium conversions for homogeneous reversible, heterogeneous reversible, and simultaneous chemical reactions under isothermal and adiabatic conditions.

C. G. von Fredersdorff

Compressibility

Nelson, L. C. and Obert, E. F. HOW TO USE THE NEW GENERALIZED COMPRESSIBILITY CHARTS. *Chem. Eng.*, **61**, 203-208 (1954) July.

Five generalized compressibility charts have

been developed from the averaged experimental data of 30 gases. The charts are based on reduced temperature and pressure, and pseudo reduced volume. Excluding hydrogen, helium, ammonia, and water, the maximum deviation of the chart from experimental data is of the order of 1 percent. The charts are presented for 5 different ranges of temperature and pressure.

B. E. Eakin

Electron Microscopy

Hibi, T. and Yada, K. HIGH-RESOLUTION REPLICAS AND THEIR APPLICATION. *J. Appl. Physics*, 25, 712-719 (1954) June.

The standard replica techniques for electron microscope study of surfaces of material are here compared with the authors' improvements of two-step replicas by using various evaporation elements to shadow them. Except for a statistical table of the qualities on evaporation of Zr, Fe, Cr, Al, the article deals with experimental results common to techniques in this field. The I.G.T. uses the two-step replica process, (1) replicating the surface of a material with "Formvar" or "Pallodion" film, and 2) performing evaporation onto it. The nozzle system for shadowing replicas, which Hibi devised, and presented in this journal, September 1952, was used. Through it, very fine edges of microspecimens are obtained and, when the morphology of these is an important factor, the device gives a valuable aid. S. Sensi

Fuel Cells

Adams, A. M. RECENT DEVELOPMENTS IN FUEL CELLS. *J. Inst. Fuel* (British), 27, 366-73 (1954) July.

Recent research in fuel cells for direct production of electricity from hydrogen and carbon fuels is reviewed. This includes the work on the Davtyan (Russian) cell, the British Electricity Authority low-pressure hydrogen, the Bacon high-pressure hydrogen, the Posner redox, and the high-temperature (above 400° C.) cells of McKee and Adams, Baur, Gorin, Justi, and Croatto. An e.m.f. of 0.73 V (1.23 V is theoretical) and voltage efficiencies of 61 to 68% have been attained. The Bacon cell is most advanced, and with improved electrodes and gas purity an early application for traction purposes is possible. A bibliography of 25 recent items is cited. O. P. Brysch

Methane Kinetics

Berlie, M. R. and Le Roy, D. J. KINETICS OF THE REACTION $H + CH_4 = CH_3 + H_2$. *Can. J. Chem.*, 32, 650-659 (1954) July.

The reaction $H + CH_4 = CH_3 + H_2$ has been studied in the temperature range 99° to 163° C. The rate constant is given by the expression $k = 1.7 \times 10^{-14} \exp(-4500/RT)$. The data are in agreement with the results, but not the interpretations, of previous work. The entropy of the methyl radical has been calculated for several temperatures. Authors' Abstract

Pressure-Volume Research

Levitt, L. S. EXTREME PRESSURES. I. A NEW PRESSURE-VOLUME RELATIONSHIP. *J. Phys. Chem.*, 58, 573-6 (1954) July.

The empirical relation $P = Ce^{B/V}$ is shown to apply to solids, liquids and gases in the very high pressure range. The constants C and B are characteristic of the particular substances. The temperature dependance of C and B are not shown. R. F. Bukacek

Vaporization

Burrows, G. COMPARISON OF THE HEATS OF VAPOR AND GAS EVOLUTION FROM LOW-VAPOR-PRESSURE LQIUIDS. *J. Appl. Chem.* (British), 4, 394-400 (1954) July.

By the use of values of heats of vaporization $\triangle H$ and of gas evolution that have been derived in a previous paper, it is now shown that a linear relationship exists between $\triangle H$ and a defined change of entropy $\triangle S$ at 298° K for both vapors and gases. Equations are also established that enable estimates to be made of the solubility of a given non-polar gas in a given low-vapor-pressure liquid, and of the value of $\triangle H$ for vaporization and for gas evolution, all at 298° K, from a knowledge of the molecular weight of the vapor or gas.

Author's Abstract

Plewes, A. C., Jardine, D. A. and Butler, R. M. THE INTEGRAL HEATS OF VAPORIZATION OF ALCOHOL-WATER MIXTURES. *Can. J. Techn.*, 32, 133-145 (1954) July.

For the three binary systems, methanol-water, ethanol-water, and n-propanol-water, between

the composition range of 10-90% by weight, the integral heats of vaporization were determined at 760 mm and 300 mm Hg by means of a calorimeter consisting of three concentric cells. From these integral heat data, enthalpy-concentration diagrams were constructed, presupposing the following facts: 1) Enthalpy of each pure component in the liquid state is zero at 0° F. 2) Specific heats and latent heats of the pure compounds are available. 3) Integral latent heats of the mixtures are known. 4) Heats of solution of the gaseous mixtures are small or approach zero. 5) Boiling point—composition data are available for the mixtures at a given pressure. S. Hu

9. ORGANIC CHEMISTRY

Acetylene Production

Bogart, M. J. and Dodd, R. H. RECENT DEVELOPMENTS IN WULFF ACETYLENE. *Chem. Eng. Progress*, 50, 372-375 (1954) July.

Economic data on the Wulff process for the manufacture of acetylene by the pyrolysis of natural gas are presented covering the range of production of 20,000,000 to 50,000,000 lb./annum. A comparison is made between single- pass cracking operations yielding residual fuel gas as a by-product, and recycle cracking wherein the ultimate yield is increased to the point of fuel self-sufficiency for the acetylene generating plant alone. An economic optimum is reached when other facilities exist for the utilization of any excess fuel from the single-pass pyrolysis operation. Authors' Abstract

Ammonia Synthesis

Mayland, B. J., Comley, E. A. and Reynolds, J. C. AMMONIA SYNTHESIS GAS. *Can. Chem. Processing*, 38, 22, 24, 28, 29 (1954) August.

Several processes involving thermal reforming and partial oxidation of natural gas for the production of ammonia synthesis gas are compared economically. The basis for the evaluation is the present cost structure in eastern Canada, however the relative positions of the several processes should be of interest in evaluation of domestic operations. Costs are based on 120 ton per day theoretical plants and are broken down into materials, operation and investment. J. M. Reid

Reidel, J. C. MAKING AMMONIA—3 NEW PLANT WILL COMBINE THREE PROCESSES. *Oil Gas J.*, 53, 78-81 (1954) August 2.

This plant of Deere & Co., at Pryor, Okla., now nearing completion will process natural gas and produce 180 tons of ammonia and 260 tons of urea daily. The Texaco process for synthesis gas by partial oxidation of natural gas with oxygen will be combined with the Casale ammonia process operating at 12,000 psi. Then the Pechiney urea process will be employed to use part of the ammonia produced. Hydrogen will be recovered by contacting the synthesis gas with monoethanolamine and washing with nitrogen from air fractionation. Process information is discussed. Featured in the new plant will be a high degree of process integration, compact layout, reduced equipment size and wide use of automatic control. E. B. Shultz

Aromatics

AROMATICS-NITRATION GRADE. *Petroleum Processing*, 9, 1224-6 (1954) August.

The largest extractive distillation facility of its kind in the U. S. for aromatics recovery from catalytic reformate is described. To recover benzene and toluene, phenol is introduced. For xylenes recovery, a mixture of cresols is used. Stabilized Platformate is first split into benzene,- toluene,- and xylenes-containing streams in two fractionating columns equipped with *Turbogrid* trays. Each cut enters its own extractive distillation tower; phenol (or cresol) enters near the top and leaves at the bottom together with the aromatic, which is separated from the solvent in a distillation column. Chemical refining of the aromatics follows by acid, caustic and water washes, and calcium chloride drying,—yielding nitration-grade products.

E. B. Shultz

Olefin Separation

Pevere, E. F., and Arnold, G. B. (assigned to The Texas Company) SEPARATION OF OLEFINS FROM MIXED HYDROCARBONS. U. S. 2,685,607 (1954) August 3.

Olefins are separated from paraffins contained in low boiling hydrocarbon mixtures (gaseous hydrocarbons, gasoline and naphtha) by selective sorption on silica gel impregnated with

silver nitrate. It is claimed that the treatment of 800 gm of calcined gel with 200 gm silver nitrate in 500 cc water, followed by drying and calcining, results in a highly improved adsorbent which is almost three times more effective than ordinary silica gel in adsorbing olefins in typical tests at pressures below about three atmospheres. E. B. Shultz

Phenol Removal

Stanley, W. E., Jr., and Dinerstein, R. A. (assigned to Standard Oil Co.) DEPHENOLIZATION. U. S. 2,683,752 (1954) July 13.

A fraction of the distillation residue of the first stage product of an Oxo synthesis is used as an extractant for phenols; one-half to 20 volumes of aqueous phenol solution (pH below 9) to one volume of extractant being contacted for 10 seconds to 15 minutes, then settled, decanted and the extractant steam-distilled to regenerate it. O. P. Brysch

10. CHEMICAL ENGINEERING

Fluid Flow

Bartlett, W. W. and Smoot, P. (assigned to United States of America) ELECTRIC GAS FLOWMETER. U. S. 2,683,986 (1954) July 20.

This invention relates to measuring the flow of gases at very low rates. The main feature is a method for blowing bubbles of uniform size with suitable equipment for counting bubbles. R. F. Bukacek

Rogers, W. L. SOUND-PRESSURE LEVELS AND FREQUENCIES PRODUCED BY FLOW OF WATER THROUGH PIPE AND FITTINGS. *Heating, Piping and Air Conditioning*, 26, 135-141 (1954) July.

Sound levels produced by one-inch straight pipe, orifices, elbows, and valves were recorded and are presented in graphical form. Variables were the velocity, length of straight pipe, area of the orifice, and setting of the globe valve. Precautions were taken to isolate the test sections, also water pressure was supplied by a pressurized tank rather than a pump. The sound was picked up by means of a microphone in the pipe wall, and both the sound pressure level of the whole frequency range and of frequency bands are presented. Certain definite general trends are indicated by the results. Increasing velocity raised the sound level in all cases except with the globe valve in a controlling position which produced a maximum value. Increasing the length of straight pipe and decreasing the area of the orifice also raised the sound level. E. F. Witt

Heat and Mass Transfer

Brown, R. L. ANALOGIES FOR MATTER, HEAT AND MOMENTUM TRANSFER. *Brit. Coal Util. Res. Assoc. Monthly Bull.*, 18, 149-156 (1954) April.

Basic definitions of the analogies between mass, heat and momentum transfer are given followed by a qualitative discussion on the application of these concepts to flow through beds of solid particles. C. G. von Fredersdorff

Pulverulent Materials

Lapple, W. C. (assigned to The Dorr Co.) HANDLING PULVERULENT MATERIALS. U. S. 2,684,869 (1954) July 27.

A method is described for regulating the flow of finely divided solid material in a vertical line from a higher to a lower level by use of an offset discharge at the lower end of the line and a controlled flow of gas to their discharge to cause the solids to flow. E. J. Pyrcioch

Lapple, W. C. and Behme, H. W. (assigned to The Dorr Co.) HANDLING PULVERULENT MATERIALS. U. S. 2,684,890 (1954) July 27.

An apparatus is described for controlling the flow of finely divided solid particles from a supply source into a carrier stream in association with a fluidized solids reactor. E. J. Pyrcioch

Mosebach, R. ZUR CHARACTERIZATION VON KORNGEMISCHEN DURCH KENNZAHLEN. (TOWARD THE CHARACTERIZATION OF PARTICLE MIXTURES BY INDEX NUMBERS.) *Erdoel und Kohle* (German), 7, 421-425 (1954) July.

Methods of representing size distributions of broken solids are reviewed including examples of normal, logarithmic and skewed probability curves. C. G. von Fredersdorff

Sittig, M. CATALYTIC PROCESS MECHANICS. *Petroleum Processing*, 9, 1048-1055 (1954) July.

A summary of available mechanical devices, solids feeders, transfer equipment and reactor shells, used in the fluid catalytic process.

W. G. Bair

Spray-Drop Size

Taylor, E. H. and Harmon, D. B., Jr. MEASURING DROP SIZES IN SPRAYS. *Ind. Eng. Chem.*, 46, 1455-57 (1954) July.

An instrument is designed to measure drop sizes in sprays by finding the total-drop-weight vs time relationship as the spray drops fall through a quiescent liquid on to an immersed scale pan. For the case of water drops falling in cooled hexane in the Reynolds number range of 1 to 25, the average drop coefficient is found to be 1.3 times that given by Stokes' law, i.e., Based on this value of C_D, $C_D = 1.3(24/Re)$. the Sauter and volumetric mean diameters are computed from the weight vs time data. The results indicate good agreement with the theoretical value obtained from the *d* nozzle vs *d* drops relationship previously derived by Harmon.

S. Hu

Tower Foundations

Jackson, E. G. FOUNDATIONS FOR SELF-SUPPORTING TOWERS. *Petroleum Refiner*, 33, 145-147 (1954) June.

Examples are given for computing anchor-bolt area, pedestal steel area, shear and bond stresses in reinforced concrete foundations, based on recent building code modifications.

C. G. von Fredersdorff

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Electrical Balance

Mauer, F. A. AN ANALYTICAL BALANCE FOR RECORDING RAPID CHANGES IN WEIGHT. *Rev. Sci. Instruments*, 25, 598-607 (1954) June.

An analytical balance has been modified so that changes in weight can be balanced electrically. Both gains and losses are recorded on a strip-chart potentiometer. An electronic damping circuit enables the balance to follow very rapid changes in weight without oscillating and with an accuracy better than 0.5 percent of full scale for ranges of 100 mg. and over.

D. J. Dennison

Humidity Calibration

Wexler, A. and Hasegawa, S. RELATIVE HUMIDITY-TEMPERATURE RELATIONSHIPS OF SOME SATURATED SALT SOLUTIONS IN THE TEMPERATURE RANGE 0° to 50° C. *J. Res. Nat. Bur. Standards*, 53, 19-26 (1954) July.

The equilibrium values of the relative humidity of the saturated solutions of several salts used in calibration and testing of hygrometers have been re-determined.

D. M. Mason

Kiln Instrumentation

Dixon, W. E., Jr. ROTARY KILN INSTRUMENTATION. *Ind. Eng. Chem.*, 46, 1436-1441 (1954) July.

This article gives a good coverage of the instrumentation of both low and high temperature kilns. Topics of kiln temperature, feed rates, exhaust gas analysis, draft, secondary air temperature, primary fuel and air are discussed. One suggested method for maximum production and economy is to 1) control kiln lining near maximum safe refractory temperature by controlling fuel rate, 2) control product temperature by controlling kiln and feed speed, 3) control excess air with oxygen analyzer and 4) control the secondary air temperature by one of several methods. If the process contains inherent long time lags further refinement is necessary.

R. T. Ellington

Suction Pyrometer

Barber, R., Jackson, R., Land, T. and Thurlow, G. G. A SUCTION PYROMETER FOR MEASURING GAS EXIT TEMPERATURES FROM THE COMBUSTION CHAMBERS OF WATER-TUBE BOILERS. *J. Inst. Fuel* (British), 27, 408-416 (1954) August.

A suction pyrometer is described which has been extensively tested up to temperatures of 2200° F. A special ceramic head was designed which extended the range of the instrument to 2600° F. The accuracy of the instrument was tested and the correction curves established.

W. G. Bair

12. MATERIALS OF CONSTRUCTION

Coke-Plant Corrosion

Dummett, G. A. and Botham, G. H. NON-FERROUS METALS AND STAINLESS STEELS IN THE COKE OVEN BY-PRODUCTS INDUSTRY. *Gas World* (British), Suppl. 16-25 (1954) July 3.

The corrosion of mild-steel and cast-iron equipment in by-product coke oven plants constitutes a great handicap in both maintenance and production. This problem is particularly acute for the recovery of ammonia, benzole, and phenols. Detailed discussion of the corrosion phenomena, as reported in the literature and from the authors' own experience, is given for individual cases and suggestions are advanced to remedy the situation by the use of stainless steels and of certain non-ferrous metals such as aluminum, copper, nickel, and their alloys. Paper includes tables showing the composition, physical and mechanical properties of these preferred alloys and some corrosion data on various metals. S. Hu

Corrosion

Dial, F. COMBATING CORROSION OFFSHORE. *World Oil*, 138, 206-208-210-212 (1954) June.

Salt water corrosion of offshore drilling structures is considered one of the most important factors to be evaluated in initiating a program of underwater exploitation. The protection of the different structural areas is outlined and the relative merits of the methods used today is evaluated. B. E. Eakin

Evans, U. R. CORROSION IN RELATION TO WELDING. *Corrosion Techn.* (British) 1, 136-140 (1954) July.

A detailed analysis is given about the forming of FeO(OH), commonly known as rust, in different metals in relation to welding. The intergranular corrosion in melted stainless steel is attributed to the formation of chromium carbide, thus impoverishing the metal of a formation of Cr protective film. A remedy is attempted by re-heating the whole piece when possible —to above 1,100° C., to bring the carbon in solution. The aluminum alloys develop a weak chemical resistance to corrosion in welded areas.—Yet, caution is given about a heat-treatment because metals vary greatly in their capacity to withstand it. D. M. Mason

Corrosion Inhibitors

Kleinheksel, S., Lawrence, P., and Nelson, F. L. LASTING PROTECTION FOR PRODUCTS PIPELINES. *Oil Gas J.* 53, 94-98 (1954) July 12.

Requirements, advantages, and results of experience with oil-soluble rust inhibitors in petroleum products pipelines are described. Other methods of rust control are also discussed. D. M. Mason

Shreir, L. L. CORROSION INHIBITORS. I. PRINCIPLES OF INHIBITION. *Corrosion Techn.*, 1, 200-203 (1954) August.

After a discussion on the principles of inhibitors, the author cites the most important anodic inhibitors as sodium or potassium salts containing anions which form soluble compounds with the metal, or which result in oxide film and passivity formation. In neutral solutions of dissolved oxygen, the cathodic reaction is the reduction of the oxygen to hydroxyl ions, thus stimulating corrosion at the anodic areas in the absence of passivation. Therefore, eliminating oxygen from the solutions by sodium sulphite or mechanical de-aeration will suppress corrosion. Limits to this assumption are outlined, as in cases of inadequate inhibitor concentration or for some peculiar circumstances where corrosion might develop at a greater rate than when no inhibitor is present. Thus, a distinction between safe and dangerous inhibitors is given and amply described. S. Sensi

Metal Identification

DeVries, G. SIMPLE METHODS OF IDENTIFYING COMMON METALS AND ALLOYS. *Ind. Heating*, 21, 670, 672, 674, 676 (1954) April.

The author presents a short resume of fifteen different types of simple tests which can be employed to identify metals of unknown composition without resorting to chemical analysis. Some of the tests discussed are hardness, spark, spot, fracture and heat treating tests. R. T. Ellington

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Current Chemical Papers (Chem. Soc., London)

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THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY